US007526737B2

(12) **United States Patent**
Simmons et al.

(10) **Patent No.: US 7,526,737 B2**
(45) **Date of Patent: Apr. 28, 2009**

(54) **FREE FORM WIPER**

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(73) Assignee: **Microsoft Corporation**, Redmond, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 501 days.

(21) Appl. No.: **11/272,960**

(22) Filed: **Nov. 14, 2005**

(65) **Prior Publication Data**

US 2007/0109281 A1 May 17, 2007

(51) **Int. Cl.**
G09G 5/00 (2006.01)
G06F 17/00 (2006.01)
G06F 3/00 (2006.01)

(52) **U.S. Cl.** **715/856**; 345/173; 345/174; 345/175; 345/179; 715/862; 715/863

(58) **Field of Classification Search** 715/770, 715/863, 856, 862; 345/170, 173, 174, 175, 345/179, 419
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,354,332	A	7/1944	Polydoroff	343/788
5,063,376	A	11/1991	Chang	345/163
5,063,600	A	11/1991	Norwood	345/173
5,133,076	A	7/1992	Hawkins et al.	708/141
5,231,698	A	7/1993	Forcier	715/541
5,321,768	A	6/1994	Fenrich et al.	382/178
5,327,342	A	7/1994	Roy	345/467
5,347,295	A	9/1994	Agulnick et al.	345/156
5,367,453	A	11/1994	Capps et al.	715/531
5,390,281	A	2/1995	Luciw et al.	395/12
5,404,442	A	4/1995	Foster et al.	395/159
5,434,929	A	7/1995	Beernink et al.	382/187
5,442,742	A	8/1995	Greyson et al.	715/539
5,446,882	A	8/1995	Capps et al.	707/104.1
5,465,325	A	11/1995	Capps et al.	345/441
5,477,447	A	12/1995	Luciw et al.	704/9

(Continued)

FOREIGN PATENT DOCUMENTS

DE 40 26 852 A1 2/1991

(Continued)

OTHER PUBLICATIONS

Ken Hinckley et al. "Design and analysis of delimiters for selection action pen gesture phrases in scriboli" Apr. 2005 10 pages.*

(Continued)

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Assistant Examiner—Haoshian Shih
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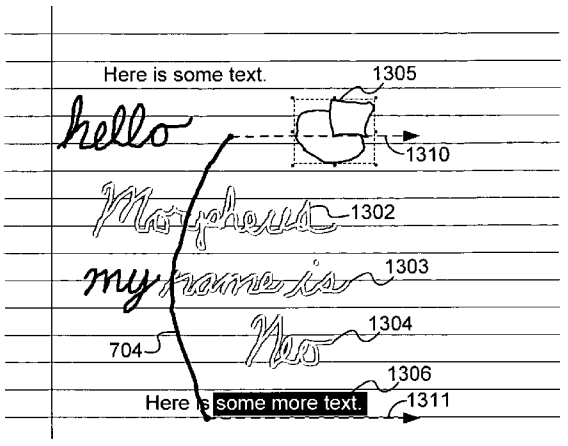
(57) **ABSTRACT**

A free-form wiper tool may be used to select and move document objects in an electronic document. A free-form wipe selection may be determined by analyzing the shape of a free-form selection in order to distinguish it from a free-form lasso selection. Once determined, document objects situated on the document in an intended direction are selected. The group of selected objects may be moved, although selected objects may be restricted in their movement, so as to be wiped or moved along only one degree of motion. Selection input may be made using a stylus and a tablet computer, and document objects may include electronic ink.

20 Claims, 11 Drawing Sheets



U.S. PATENT DOCUMENTS

5,479,596	A	12/1995	Capps et al.	715/539
5,491,495	A	2/1996	Ward et al.	345/173
5,500,937	A	3/1996	Thompson-Rohrlich	715/764
5,513,309	A	4/1996	Meier et al.	715/860
5,517,578	A	5/1996	Altman et al.	382/181
5,523,775	A	6/1996	Capps	345/179
5,528,743	A	6/1996	Tou et al.	715/541
5,544,295	A	8/1996	Capps	345/473
5,544,358	A	8/1996	Capps et al.	715/523
5,555,363	A	9/1996	Tou et al.	715/541
5,559,942	A	9/1996	Gough et al.	715/802
5,561,446	A	10/1996	Montlick	345/173
5,579,467	A	11/1996	Capps	715/507
5,583,542	A	12/1996	Capps et al.	345/173
5,588,105	A	12/1996	Foster et al.	715/779
5,590,257	A	12/1996	Forcier	715/530
5,592,566	A	1/1997	Pagallo et al.	382/187
5,594,640	A	1/1997	Capps et al.	715/532
5,596,350	A	1/1997	Capps et al.	345/173
5,596,694	A	1/1997	Capps	345/473
5,596,697	A	1/1997	Foster et al.	715/810
5,602,570	A	2/1997	Capps et al.	345/173
5,613,019	A	3/1997	Altman et al.	382/311
5,634,102	A	5/1997	Capps	715/744
5,649,133	A	7/1997	Arquie	715/764
5,655,136	A	8/1997	Morgan	382/187
5,666,139	A	9/1997	Thielens et al.	345/173
5,666,552	A	9/1997	Greyson et al.	715/539
5,671,438	A	9/1997	Capps et al.	715/539
5,682,439	A	10/1997	Beernink et al.	382/187
5,710,831	A	1/1998	Beernink et al.	382/189
5,745,716	A	4/1998	Tchao et al.	715/777
5,757,383	A	5/1998	Lipton	345/442
5,760,773	A	6/1998	Berman et al.	715/808
5,764,818	A	6/1998	Capps et al.	382/317
5,768,418	A	6/1998	Berman et al.	382/187
5,778,404	A	7/1998	Capps et al.	715/531
5,796,397	A	8/1998	Kusano	715/804
5,809,498	A	9/1998	Lopresti et al.	707/6
5,838,326	A	11/1998	Card et al.	715/775
5,838,819	A	11/1998	Ruedisueli et al.	382/187
5,864,635	A	1/1999	Zetts et al.	382/187
5,867,150	A	2/1999	Bricklin	345/173
5,874,957	A	2/1999	Cline et al.	715/786
5,880,743	A	3/1999	Moran et al.	345/473
5,911,145	A	6/1999	Arora et al.	715/514
5,953,735	A	9/1999	Forcier	715/541
5,963,208	A	10/1999	Dolan et al.	715/760
5,970,455	A	10/1999	Wilcox et al.	704/270
5,993,391	A	11/1999	Kamiyama	345/607
6,020,895	A	2/2000	Azami	345/619
6,021,218	A	2/2000	Capps et al.	382/187
6,035,324	A	3/2000	Chang et al.	709/203
6,061,472	A	5/2000	Hullender et al.	382/187
6,069,626	A	5/2000	Cline et al.	715/786
6,081,829	A	6/2000	Sidana	709/203
6,108,445	A	8/2000	Uehara	382/189
6,128,007	A	10/2000	Seybold	345/179
6,128,633	A	10/2000	Michelman et al.	715/525
6,154,219	A	11/2000	Wiley et al.	345/587
6,154,758	A	11/2000	Chiang	715/541
6,188,405	B1	2/2001	Czerwinski et al.	715/764
6,199,125	B1	3/2001	Cortesi	710/67
6,223,145	B1	4/2001	Hearst	703/22
6,243,258	B1	6/2001	Paratore	361/680
6,279,014	B1	8/2001	Schilit et al.	715/512
6,295,372	B1	9/2001	Hawkins et al.	382/187
6,304,272	B1	10/2001	Schanel et al.	345/676
6,337,698	B1	1/2002	Keely, Jr. et al.	715/823
6,340,967	B1	1/2002	Maxted	345/179
6,345,389	B1	2/2002	Dureau	725/116
6,348,935	B1	2/2002	Malacinski et al.	715/853
6,355,889	B1	3/2002	Butcher	178/18.03
6,380,957	B1	4/2002	Banning	715/828
6,487,567	B1	11/2002	Michelman et al.	715/525
6,487,569	B1	11/2002	Lui et al.	715/530
6,529,215	B2	3/2003	Golovchinsky et al.	715/764
6,546,397	B1	4/2003	Rempell	707/102
6,559,871	B1	5/2003	Brozowski et al.	715/853
6,565,611	B1	5/2003	Wilcox et al.	715/541
6,570,596	B2	5/2003	Frederiksen	715/808
6,594,390	B2	7/2003	Frink et al.	382/187
6,650,347	B1	11/2003	Nulu et al.	715/853
6,651,221	B1	11/2003	Thomason et al.	715/541
6,654,035	B1	11/2003	DeStefano	715/798
6,661,409	B2	12/2003	Demartines et al.	345/173
6,678,865	B1	1/2004	Pratley et al.	715/509
6,681,045	B1	1/2004	Lapstun et al.	382/187
6,683,600	B1	1/2004	Lui	345/179
6,690,364	B1	2/2004	Webb	345/173
6,727,927	B1	4/2004	Dempski et al.	715/853
6,741,749	B2	5/2004	Herbert, Jr.	382/246
6,801,190	B1	10/2004	Robinson et al.	345/173
6,833,827	B2	12/2004	Lui et al.	345/173
6,836,759	B1	12/2004	Williamson et al.	704/235
6,859,909	B1	2/2005	Lerner et al.	715/512
6,989,822	B2	1/2006	Pettiross et al.	345/179
7,002,560	B2	2/2006	Graham	345/179
7,039,234	B2	5/2006	Geidl et al.	382/187
7,055,110	B2	5/2006	Kupka	715/863
7,079,713	B2	7/2006	Simmons	382/321
7,091,959	B1	8/2006	Clary	345/173
7,096,432	B2	8/2006	Huapaya et al.	715/863
7,174,042	B1	2/2007	Simmons et al.	382/187
7,185,278	B1 *	2/2007	Simmons	715/235
7,188,309	B2	3/2007	Simmons et al.	715/244
7,240,300	B2 *	7/2007	Jaeger	715/863
7,259,752	B1	8/2007	Simmons	345/173
7,259,753	B2	8/2007	Keely et al.	345/179
7,353,453	B1	4/2008	Simmons	715/268
7,358,965	B2	4/2008	Barabe et al.	345/179
7,370,288	B1	5/2008	Simmons et al.	715/854
2001/0000960	A1	5/2001	Dettloff	343/748
2002/0078035	A1	6/2002	Frank et al.	707/3
2002/0097270	A1	7/2002	Keely et al.	345/764
2002/0126153	A1	9/2002	Withers et al.	345/773
2003/0066031	A1	4/2003	Laane	715/513
2003/0071850	A1	4/2003	Geidl	345/781
2003/0085931	A1	5/2003	Card et al.	345/853
2003/0119469	A1	6/2003	Karr et al.	455/307
2003/0214491	A1	11/2003	Keely et al.	345/179
2003/0214531	A1	11/2003	Chambers et al.	345/764
2003/0215142	A1	11/2003	Gounares	382/190
2003/0227491	A1	12/2003	Moehrle	345/854
2004/0003350	A1	1/2004	Simmons et al.	715/517
2004/0021701	A1	2/2004	Iwema et al.	345/863
2004/0060000	A1	3/2004	Jaeger	715/502
2004/0135824	A1	7/2004	Fitzmaurice	345/856
2004/0141015	A1	7/2004	Fitzmaurice et al.	345/856
2005/0028081	A1	2/2005	Arcuri et al.	715/501.1
2005/0179647	A1	8/2005	Simmons et al.	345/156
2005/0183029	A1	8/2005	Barabe et al.	715/779
2005/0206627	A1	9/2005	Simmons	345/179
2006/0001656	A1 *	1/2006	LaViola et al.	345/179
2006/0233464	A1	10/2006	Simmons	382/321
2006/0267967	A1 *	11/2006	Hinckley et al.	345/179

FOREIGN PATENT DOCUMENTS

EP	0460420	A2	12/1991
EP	0 780 797	A	6/1997
EP	1 376 390	A	1/2004
EP	1450294	A1	8/2004
EP	1486883	A2	12/2004

GB	2 313 993 A	12/1997
JP	3-270403	12/1991

OTHER PUBLICATIONS

Wilcox et al., "Dynomite: A Dynamically Organized Ink and Audio Notebook," Computer-Human Interaction, Mar. 27, 1997, pp. 186-193.

Jakobsen, T., "Advanced Character Physics," Game Developer's Conference, 2001 Proceedings, pp. 1-17.

Fitzmaurice et al., "Tracking Menus," CHI 2003, vol. 5, No. 2, pp. 71-80, 2003.

U.S. Official Action mailed Aug. 5, 2008, in U.S. Appl. No. 10/781,489.

U.S. Appl. No. 10/780,366 filed Feb. 17, 2004, entitled "Writing Guide for a Free-Form document Editor", Inventors: Alex Simmons et al.

U.S. Official Action mailed Nov. 19, 2008, in U.S. Appl. No.10/804,616.

U.S. Official Action mailed Jan. 10, 2008, in U.S. Appl. No. 10/804,616.

U.S. Official Action mailed Jul. 12, 2007, in U.S. Appl. No. 10/804,616.

U.S. Official Action mailed Aug. 5, 2008, in U.S. Appl. No. 10/781,489.

U.S. Official Action mailed Dec. 27, 2007, in U.S. Appl. No. 10/781,489.

U.S. Official Action mailed Jun. 28, 2007, in U.S. Appl. No. 10/781,489.

U.S. Official Action mailed Nov. 7, 2006, in U.S. Appl. No. 10/781,489.

U.S. Official Action mailed Apr. 20, 2006, in U.S. Appl. No. 10/781,489.

U.S. Official Action mailed Aug. 20, 2008, in U.S. Appl. No. 10/780,366.

U.S. Official Action mailed Nov. 14, 2007, in U.S. Appl. No. 10/780,366.

U.S. Official Action mailed Sep. 20, 2005, in U.S. Appl. No. 10/186,463.

U.S. Official Action mailed May 18, 2007, in U.S. Appl. No. 10/186,820.

U.S. Official Action mailed Nov. 24, 2006, in U.S. Appl. No. 10/186,820.

U.S. Official Action mailed Nov. 9, 2006, in U.S. Appl. No. 10/186,820.

U.S. Official Action mailed Mar. 2, 2006, in U.S. Appl. No. 10/186,820.

U.S. Official Action mailed Aug. 10, 2005, in U.S. Appl. No. 10/186,820.

U.S. Official Action mailed Mar. 1, 2006, in U.S. Appl. No. 10/186,837.

U.S. Official Action mailed May 25, 2005, in U.S. Appl. No. 10/186,837.

U.S. Official Action mailed Mar. 13, 2006, in U.S. Appl. No. 10/186,812.

U.S. Official Action mailed Jul. 13, 2005, in U.S. Appl. No. 10/186,812.

U.S. Official Action mailed Feb. 28, 2005, in U.S. Appl. No. 10/186,812.

U.S. Official Action mailed Apr. 21, 2006, in U.S. Appl. No. 10/186,865.

U.S. Official Action mailed Sep. 20, 2005, in U.S. Appl. No. 10/186,865.

U.S. Official Action mailed Aug. 22, 2007, in U.S. Appl. No. 10/186,874.

U.S. Official Action mailed Jan. 3, 2007, in U.S. Appl. No. 10/186,874.

U.S. Officical Action mailed Aug. 10, 2006, in U.S. Appl. No. 10/186,874.

U.S. Official Action mailed Jun. 29, 2005, in U.S. Appl. No. 10/186,874.

U.S. Official Action mailed Sep. 15, 2006, in U.S. Appl. No. 10/186,847.

U.S. Official Action mailed Jan. 27, 2006, in U.S. Appl. No. 10/186,847.

U.S. Official Action mailed Jul. 27, 2005, in U.S. Appl. No. 10/186,847.

U.S. Official Action mailed Nov. 12, 2008, in U.S. Appl. No. 10/782,133.

U.S. Official Action mailed Feb. 20, 2008, in U.S. Appl. No. 10/782,133.

U.S. Official Action mailed Sep. 18, 2007, in U.S. Appl. No. 10/782,133.

U.S. Official Action mailed Mar. 2, 2007, in U.S. Appl. No. 10/782,133.

U.S. Official Action mailed Jan. 3, 2007, in U.S. Appl. No. 10/782,132.

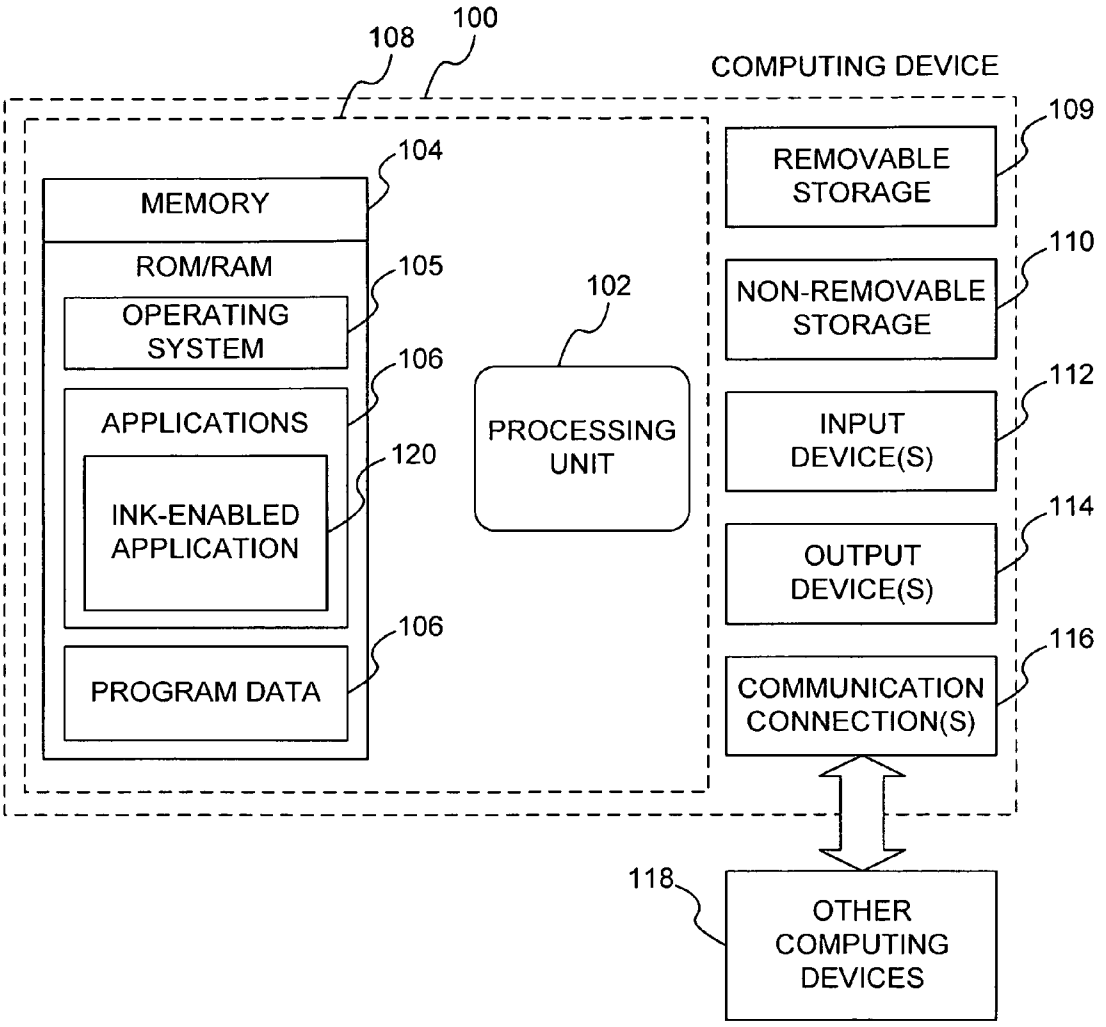
Microsoft Word 2000, Microsoft Corporation (9.0.6926 sp-3).

European Search Report dated Nov. 11, 2005.

Wacom Intuos TM User's Manual for Windows, May 22, 2000, copyright Wacom Company, Ltd., pp. 1-165 (Part 1: pp 1-60: Part 2: pp. 61-120 ; Part 3: pp. 121-165).

U.S. Official Action mailed Dec. 17, 2004, in U.S. Appl. No. 10/186,837.

* cited by examiner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COMPUTING DEVICE
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REMOVABLE STORAGE
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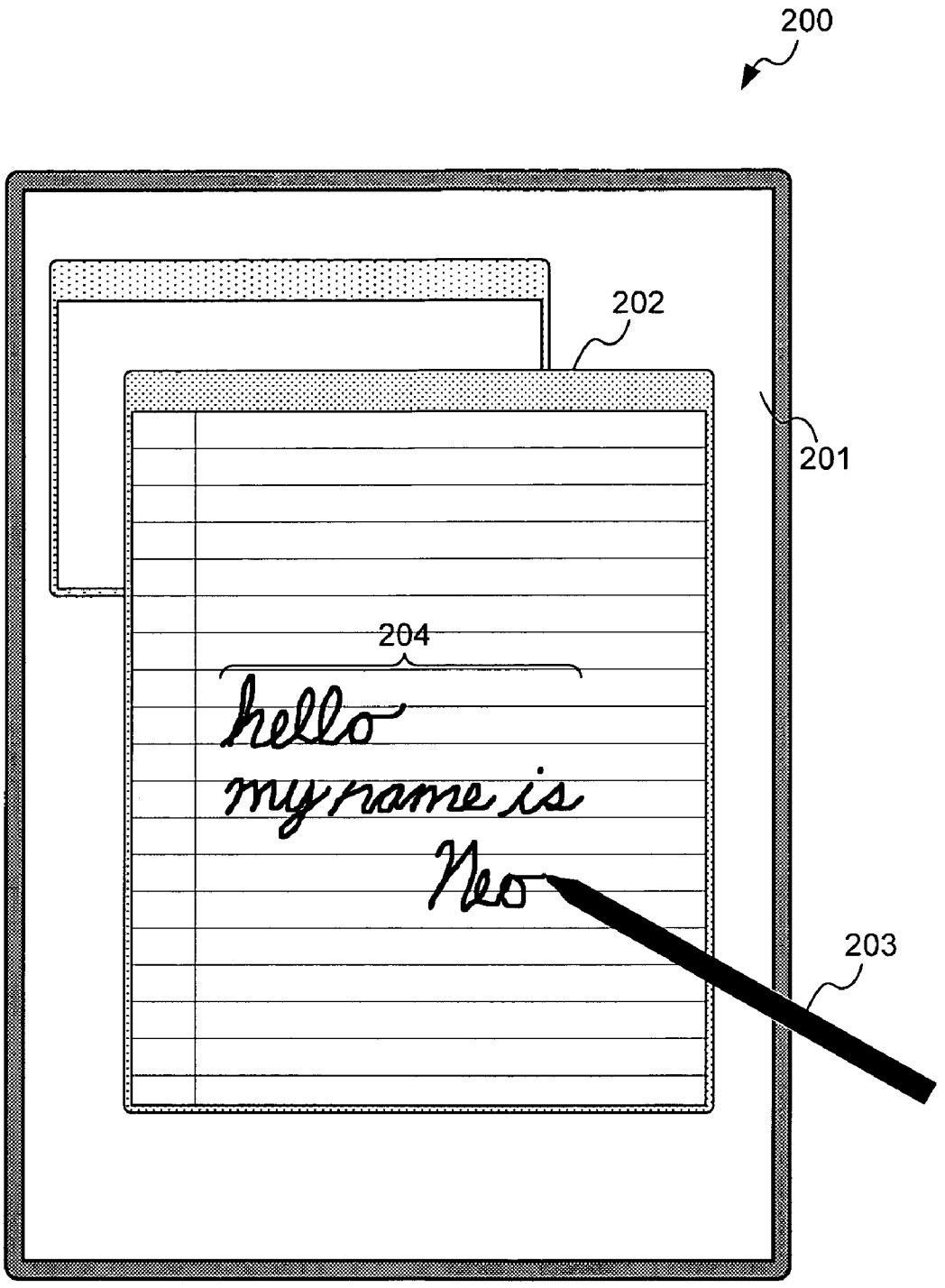
MEMORY
ROM/RAM
105
OPERATING SYSTEM
110
NON-REMOVABLE STORAGE
102
106
APPLICATIONS
112
INPUT DEVICE(S)
PROCESSING UNIT
120
INK-ENABLED APPLICATION
114
OUTPUT DEVICE(S)
106
116
PROGRAM DATA
COMMUNICATION CONNECTION(S)
118
OTHER COMPUTING DEVICES

FIG. 1



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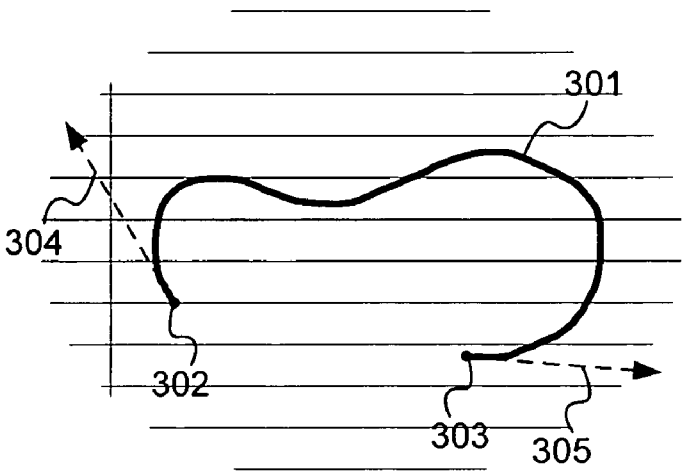
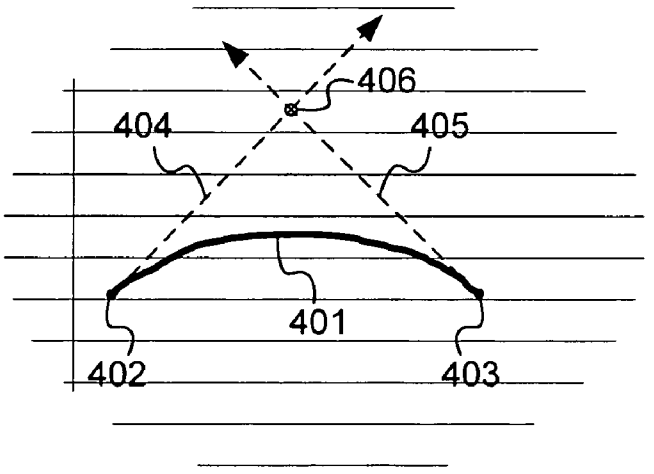


FIG. 3



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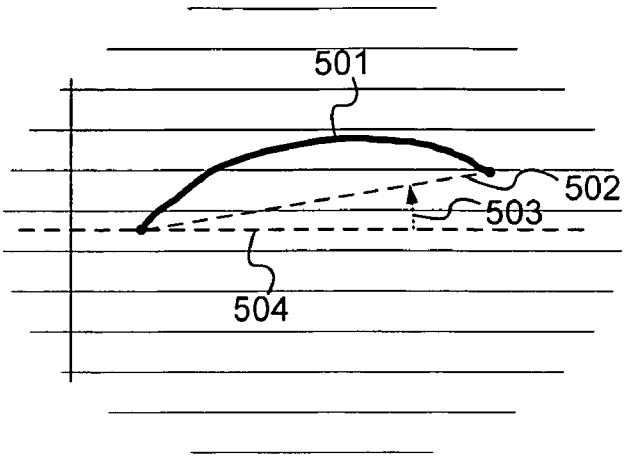
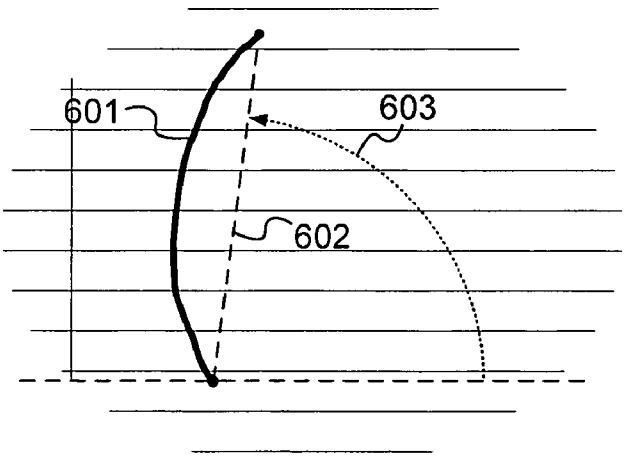


FIG. 5



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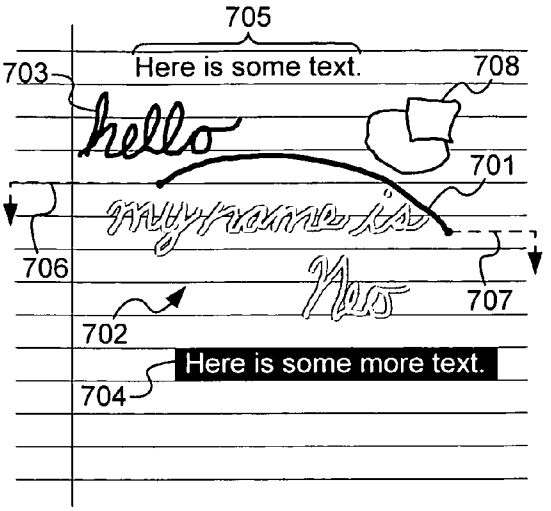

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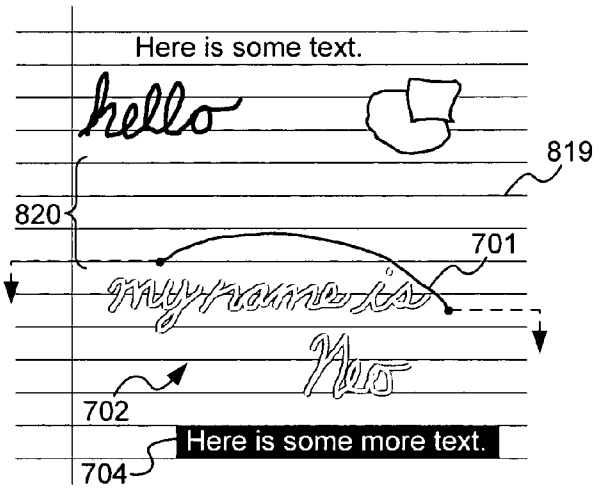

FIG. 8

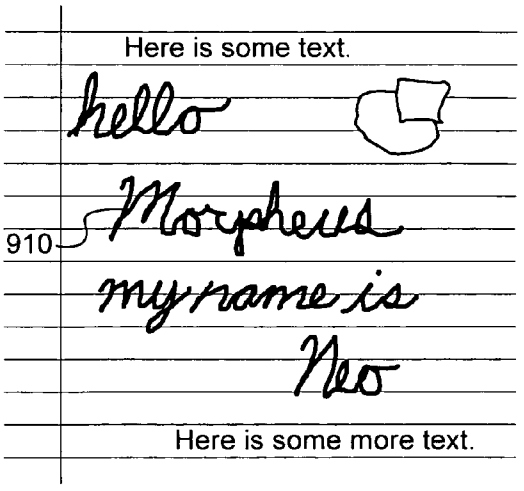

FIG. 9

1 Lorem ipsum dolor sit amet, consectetuer
2 adipiscing elit. Praesent egestas mattis neque.
3 Vestibulum interdum diam non felis. Sed augue
4 lorem, egestas porttitor, egestas rhoncus, vulputate
5 vel, nunc. Vestibulum sed dolor ut quam bibendum
6 interdum. Nunc convallis, nulla id venenati.

FIG. 10

1 Lorem ipsum dolor sit amet, consectetuer
2 adipiscing elit. Praesent egestas mattis neque.
3 Vestibulum interdum diam non felis. Sed augue
4 lorem, egestas porttitor, egestas rhoncus,
5 vulputate vel, nunc. Vestibulum sed dolor ut quam
6 bibendum interdum. Nunc convallis, nulla id venenati.

FIG. 11

1 Lorem ipsum dolor sit amet, consectetuer
2 adipiscing elit. Praesent egestas mattis neque.
3 Vestibulum interdum diam non felis. Sed augue
4 lorem, egestas porttitor, et ta egestas rhoncus,
5 vulputate vel, nunc. Vestibulum sed dolor ut quam
6 bibendum interdum. Nunc convallis, nulla id venenati.

FIG. 12

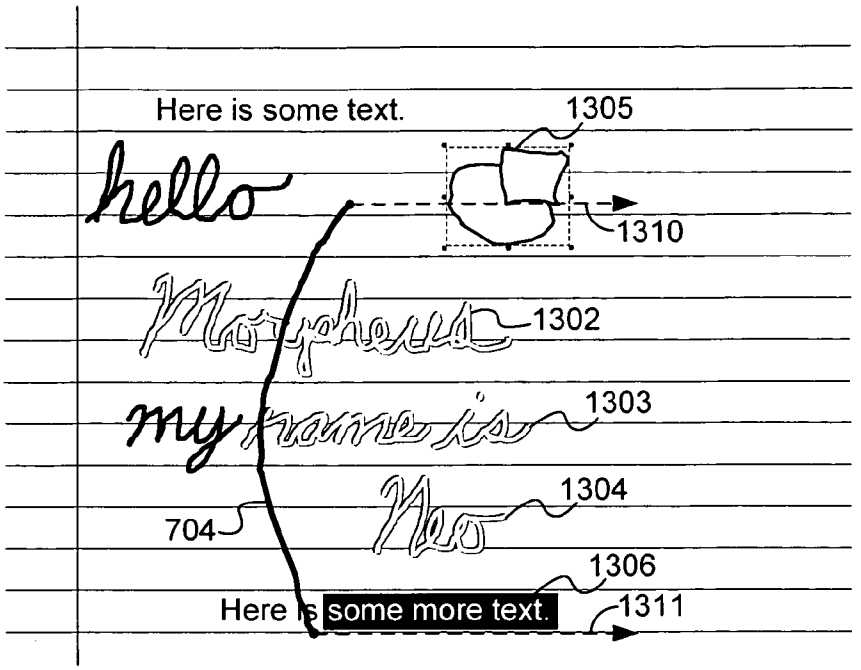
Here is some text.
1305
hello
1310
Morpheus
1302
my name is
1303
Neo
1304
704
1306
Here is some more text.
1311

FIG. 13

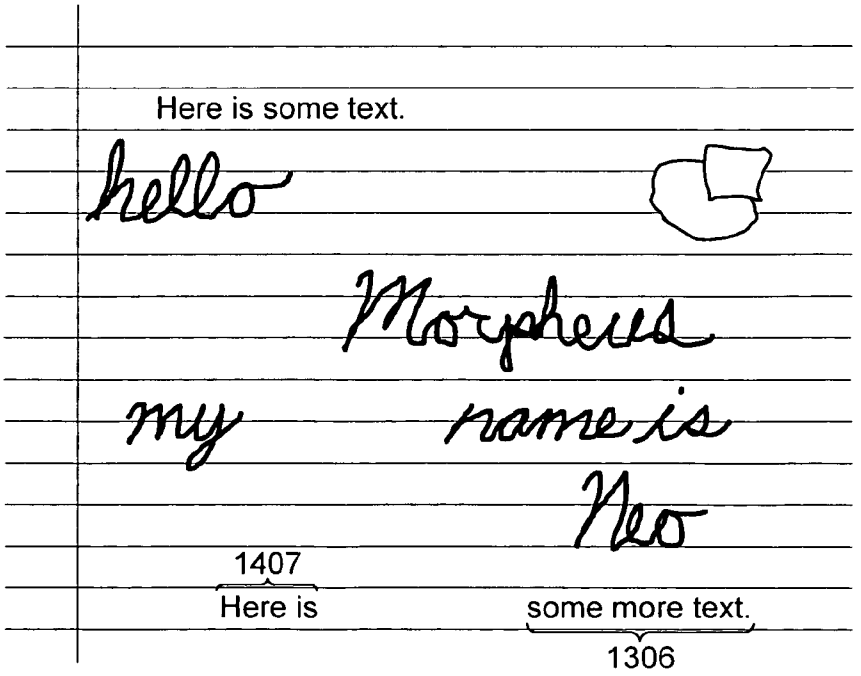
Here is some text.
hello
Morpheus
my name is
Neo
1407
Here is
some more text.
1306

FIG. 14

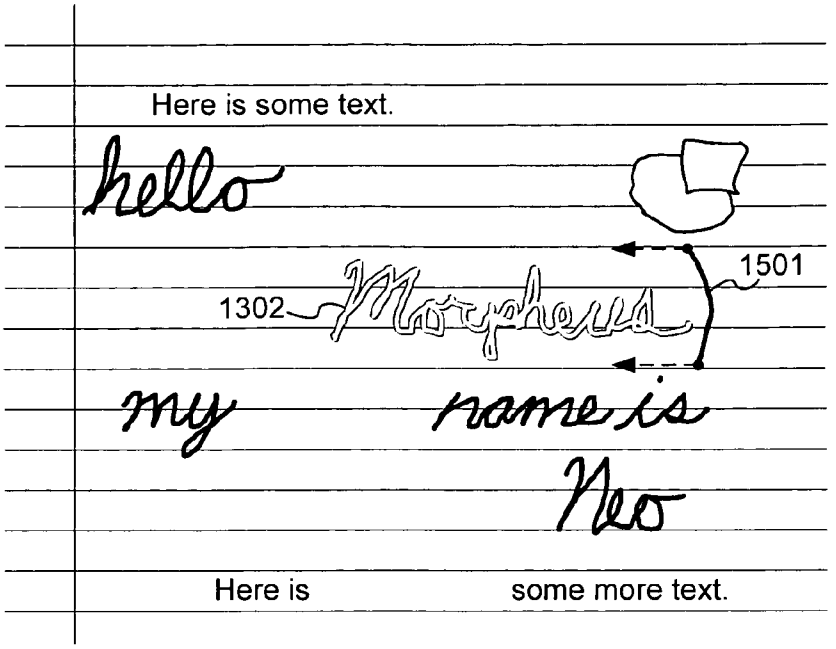
Here is some text.
hello
1501
1302
Morpheus
my name is
Neo
Here is some more text.

FIG. 15

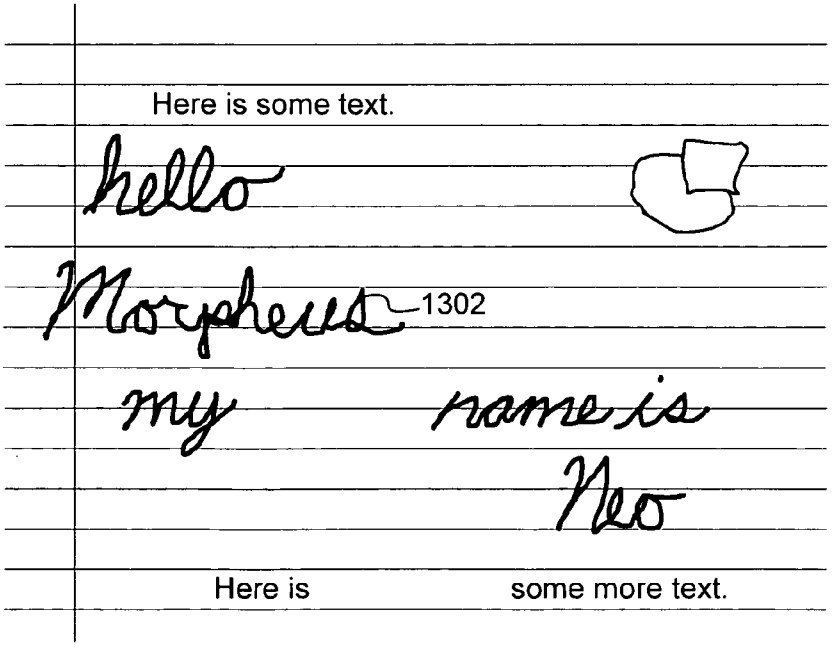
Here is some text.
hello
Morpheus
1302
my name is
Neo
Here is some more text.

FIG. 16

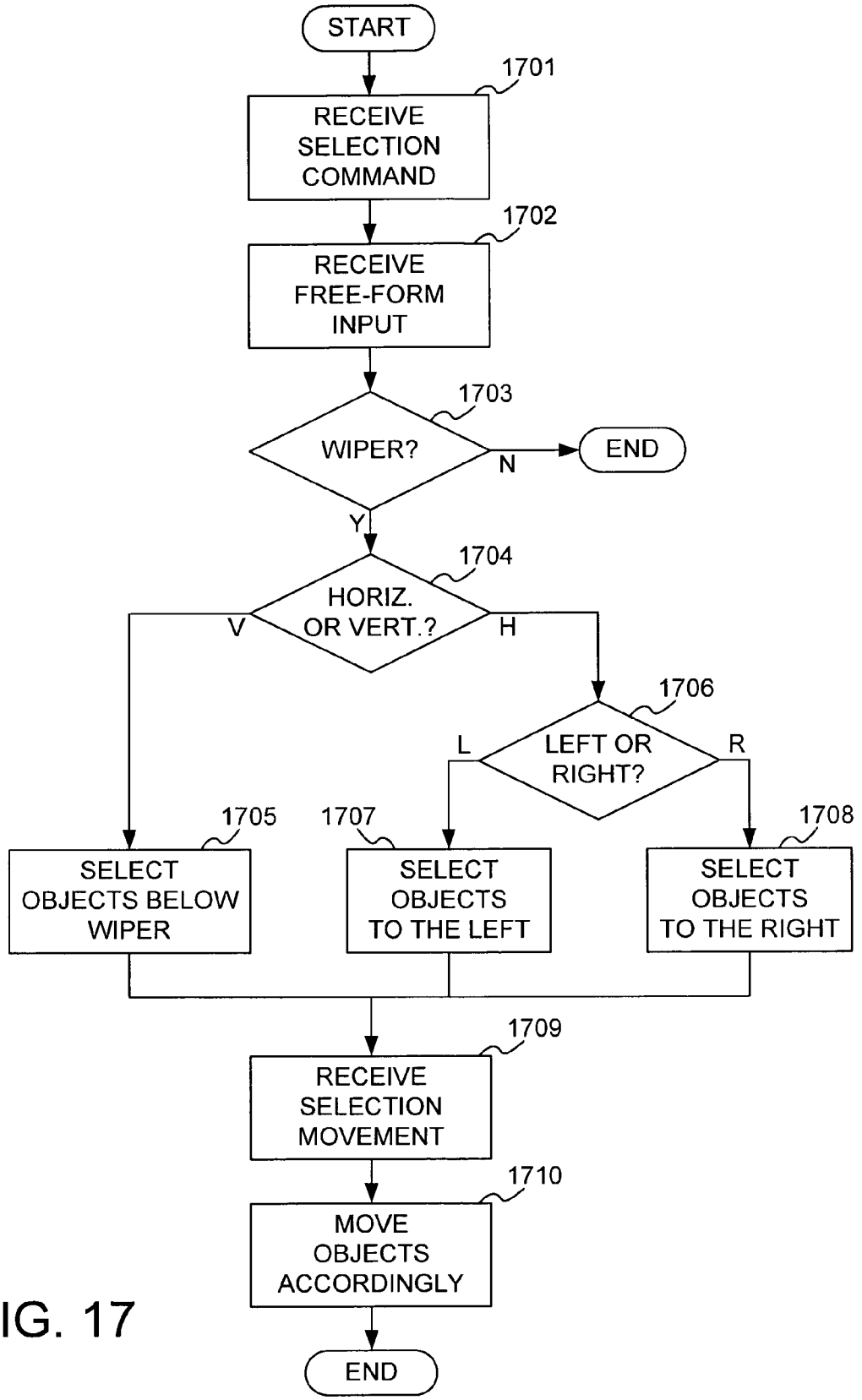
START
1701
RECEIVE SELECTION COMMAND
1702
RECEIVE FREE-FORM INPUT
1703
WIPER?
N
END
Y
1704
HORIZ. OR VERT.?
V
H
1706
LEFT OR RIGHT?
L
R
1705
SELECT OBJECTS BELOW WIPER
1707
SELECT OBJECTS TO THE LEFT
1708
SELECT OBJECTS TO THE RIGHT
1709
RECEIVE SELECTION MOVEMENT
1710
MOVE OBJECTS ACCORDINGLY
END

FIG. 17

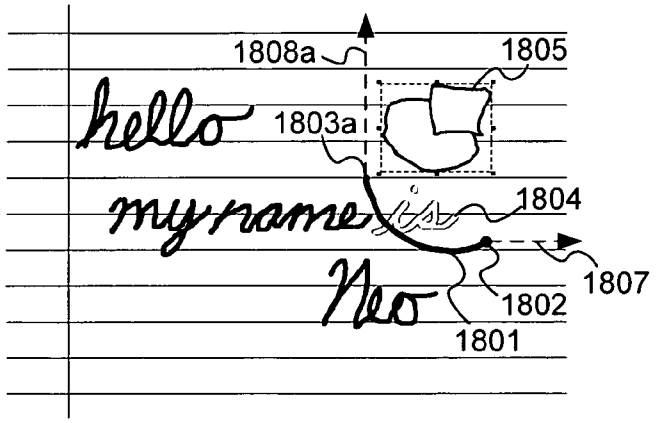

FIG. 18A

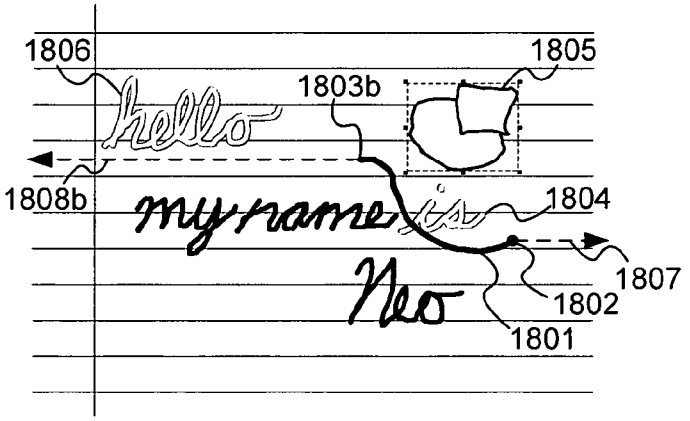

FIG. 18B

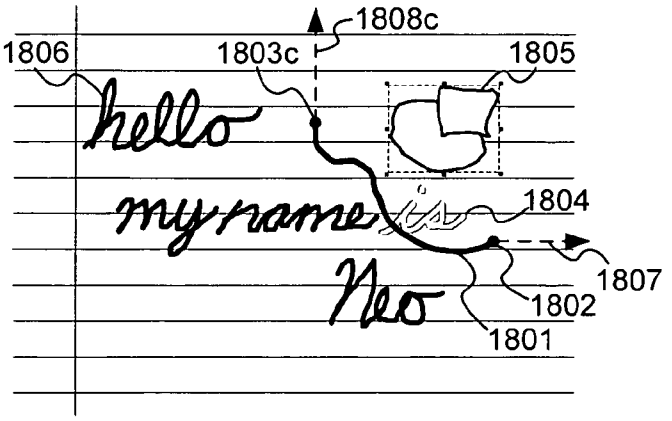

FIG. 18C

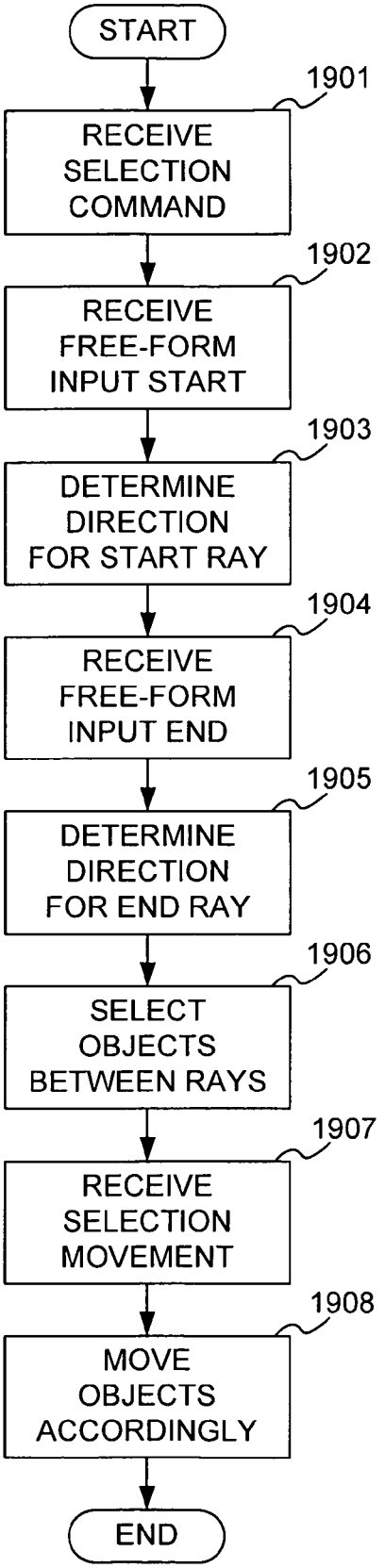
START
1901
RECEIVE SELECTION COMMAND
1902
RECEIVE FREE-FORM INPUT START
1903
DETERMINE DIRECTION FOR START RAY
1904
RECEIVE FREE-FORM INPUT END
1905
DETERMINE DIRECTION FOR END RAY
1906
SELECT OBJECTS BETWEEN RAYS
1907
RECEIVE SELECTION MOVEMENT
1908
MOVE OBJECTS ACCORDINGLY
END

FIG. 19

FREE FORM WIPER

RELATED APPLICATIONS

This patent application is related to co-pending non-provisional U.S. patent application Ser. No. 10/186,837 entitled "Space Management for Electronic Documents," which is hereby incorporated by reference.

BACKGROUND

Whether for word processing, note taking, slide presentations, or graphics editing, nearly every computer user has edited a document at one time or another. Although initially purely text-based, software applications for editing documents have greatly benefited from the advent of graphical operating systems. Interactive what-you-see-is-what-you-get (WYSIWYG) interfaces and additional enhancements of such operating systems have made software applications more accessible and intuitive for average users.

Electronic ink interfaces in particular have enhanced the common tasks associated with editing documents. Users have benefited from the ability to interact directly with a computer display, easily handwriting, drawing figures, and otherwise manipulating document objects using a stylus, finger, or other implement. While similar to the point-and-click paradigm of using a mouse, electronic ink makes many document-editing tasks even easier, a prime example being handwriting.

Virtually every document-editing task associated with a point-and-click mouse or trackball has been replicated for use with a stylus and electronic ink. As such, users may create text and drawings, as well as select and manipulate objects using a stylus and conventional editing tools. However, new paradigms for editing documents may be made possible by electronic ink. Such paradigms may allow for even faster and more efficient document editing, enabling users to, for example, select and move several objects vertically or horizontally on a page.

Previously, a wiper bar tool has been described. Such tools may allow for objects in a document to be moved up or down a page, extending page margins appropriately. A wiper tool may be invoked by setting an insertion point and signaling a wipe. Whereas the wiper bar tool may be useful for creating space on a page, it may not allow unrestricted wiping and may not fully take advantage of the unique features of electronic ink.

There is a need in the art for new document editing paradigms that leverage the unique features of electronic ink, particularly for the unrestricted selection and movement of document objects.

SUMMARY

Methods and systems are provided for receiving a selection input capable of selecting objects in a document within certain portions of the document. A free-form selection path is entered by a user with a mouse, stylus, or other input device. The path may be analyzed to determine whether it is intended to be a free-form wipe, or other type of selection (e.g., lasso selection). Next the path is analyzed to determine a direction of selection, whether above, below, to the left or right (or quadrant subsets thereof) of the selection path. Users may further modify selected objects with further input; for example, changing which side of a selection path should be selected based on cursor movement.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing brief summary of the invention, as well as the following detailed description, is better understood when read in conjunction with the accompanying drawings, which are included by way of example, and not by way of limitation with regard to the claimed invention. In the accompanying drawings, the same or similar elements are labeled with the same reference numbers.

FIG. **1** depicts an exemplary operating environment in which one or more embodiments may be implemented.

FIG. **2** depicts an exemplary operating environment in which one or more embodiments may be implemented.

FIGS. **3** and **4** depict free-form selection boundaries according to one or more embodiments of the invention.

FIGS. **5** and **6** depict one embodiment for determining the orientation of a wipe selection.

FIGS. **7-9** depict document objects being selected and moved by a vertical wipe according to one or more embodiments.

FIGS. **10-12** depict text moved with a horizontal wipe in order to insert new text according to one or more embodiments.

FIGS. **13-16** depict a collection of document objects, some of which are wiped to the right and to the left, according to one or more embodiments.

FIG. **17** is a flowchart depicting a method for using a free-form wiper tool according to one or more embodiments.

FIGS. **18**A-**18**C depict a series of document objects being dynamically selected by a selection path according to one or more embodiments.

FIG. **19** is a flowchart depicting a method for selecting objects in a document using two rays according to one or more embodiments.

DETAILED DESCRIPTION

A free-form wiper tool may take advantage of the unique features of electronic ink, allowing for vertical or horizontal selection and movement of objects across an electronic document. The results in the flexible insertion of empty space into which additional objects may be moved or created. A wipe selection may be limited in the direction it can move, only horizontally or vertically, for example. By analyzing the path of a stylus across a page, it can be determined whether a user intends a wipe or lasso type selection. Further, it can be determined whether a horizontal or vertical wipe is intended, and if horizontal, whether the wipe will be to the left or the right. Furthermore, a direction and distance of a wipe can be determined. Provided below are examples and descriptions of various embodiments of a free-form wiper, including examples of operating environments in which the wiper may be implemented. Further, provided are examples of the methods that may be used to implement the tool.

FIG. **1** depicts an exemplary operating environment in which one or more embodiments may be implemented. The operating environment may comprise computing device **100** which may work alone or with other computing devices **118**. Computing device **100** may comprise memory storage **104** coupled to processing unit **102**. Any suitable combination of hardware, software, and/or firmware may be used to implement memory **104**, processing unit **102** and other components. By way of example, memory **104**, processing unit **102**, and/or other components may be implemented within com-

puting device **100** as shown, or may be implemented in combination with other computing devices **118**. The systems, devices, and processors shown are used merely as examples of embodiments.

Generally, program modules may include routines, programs, components, data structures, and other types of structures that perform particular tasks or implement particular abstract data types. Moreover, embodiments may be practiced with other computer system configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, mainframe computers, set-top boxes, and so forth. Embodiments may also be practiced in distributed computing environments where tasks are performed by other computing devices **118** that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

Embodiments, for example, may be implemented as a computer process or method (e.g., in hardware or in software), a computing system, or as an article of manufacture, such as a computer program product or computer readable media. The computer program product may be a computer storage media readable by a computer system and encoding a computer program of instructions for executing a process on computing device **100**. The computer program product may also be a propagated signal on a carrier readable by a computing system and subsequently stored on a computer readable medium on computing device **100**.

With reference to FIG. **1**, the embodiment shown may include a computing device, such as computing device **100**. In a basic configuration, computer device **100** may include at least one processing unit **102**, and memory **104**. Depending on the configuration of the computer device, memory **104** may be volatile (e.g., Random Access Memory (RAM)), non-volatile (e.g., Read-Only Memory (ROM), Flash, etc.), or some combination thereof. Memory **104** may serve as a storage location for operating system **105**, one or more applications **106**, and may include program data **107**, as well as other programs. In one embodiment, applications **106** may include an electronic ink-enabled application **120**. Examples of operating system **105** are found in the family of WINDOWS operating systems from MICROSOFT CORPORATION of Redmond, Wash.

Although the basic computing device configuration is contained with dashed-line box **108**, computing device **100** may include additional features and functionality. For example, computing device **100** may include additional data storage components, including both removable storage **109** (e.g., floppy disks, memory cards, compact disc (CD) ROMs, digital video discs (DVDs), external hard drives, universal serial bus (USB) keys, etc.) and non-removable storage **110** (e.g., magnetic hard drives).

Computer storage media may include media implemented in any method or technology for storage of information, including computer readable instructions, data structures, program modules, or other data. Memory **104**, removable storage **109**, and non-removable storage **110** are all examples of computer storage media. Further examples of such media include RAM, ROM, electrically-erasable programmable ROM (EEPROM), flash memory, CD-DVD, cassettes, magnetic tape, magnetic disks, and so forth. Any such computer storage media may be accessed by components which are a part of computing device **100**, or which are external to computing device **100** and connected via a communications link (e.g., Bluetooth, USB, parallel, serial, infrared, etc.). Computing device **100** may also include input devices **112**, such as keyboards, mice, pens, microphone, touchpad, touch-display, etc. Output devices **114** may include displays, speakers, printers, and so forth. Additional forms of storage, input, and output devices may be utilized.

Computing device **100** may also include one or more communication connections **116** which allow the computing device to communicate with other computing devices **118**, such as over a network (e.g., a local area network (LAN), the Internet, etc.). Communication media, in the form of computer readable instructions, data structures, program modules, or other data in a modulated data signal, may be shared with and by device **100** via communication connection **116**. Modulated data signal may mean a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal, and may include a modulated carrier wave or other transport mechanism. Communication connection **116** may be comprised of hardware and/or software enabling either a wired (e.g., Ethernet, USB, Token Ring, modem, etc.) or wireless (e.g., WiFi, WiMax, cellular, acoustic, infrared, radio frequency (RF), etc.) communication conduit with other devices **118**.

FIG. **2** depicts an exemplary operating environment in which one or more embodiments may be implemented. In certain embodiments, tablet computer **200** may be an implementation of generic computing device **100**. Tablet computer **200** includes sensitive display **201**, which may be touch-sensitive and/or electro-magnetically sensitive. Other types of sensing displays may also be used. Tablet computer **200** has a graphical operating system **105** installed, one that uses multiple windows to display the interfaces of various software applications in use on the computer.

One piece of software installed on tablet computer **200** may be an electronic ink-enabled application **120**, for which window **202** may be the visible interface on display **201**. Electronic ink is a term used generally to refer to handwritten input for use with computing devices. This input may be entered using a stylus (or other pointing implement) **203** in proximity to a display, as displayed in FIG. **2**. Likewise, electronic ink may be input using a touch pad, tablet, mouse, or other input device allowing free-hand input. Ink-enabled operating systems and/or applications should generally be able to receive, display, and process this free-hand input, although software translators may allow non-ink-enabled software to receive input in this fashion.

FIG. **2** includes an example of electronic ink input **204**, which has been input into ink-enabled application **120** using stylus **203**, and displayed as handwriting on window **202**. A user is able to press stylus **203** to display **201** and move it as if the user were writing. Display **200** may include a touch-sensitive or electro-magnetically sensitive layer that senses the location of stylus **203** and digitizes the position. As the stylus moves, additional digitized positions are provided. These positions may be in the form of horizontal and vertical pixel values, or some other scale. In addition, the exerted pressure (or tip proximity) may be measured and the value stored along with the position. Furthermore, a relative or absolute time may be stored with the position as well. This sequence of positions and/or measurements may be stored in a data structure referred to as an ink object. Furthermore, an ink object may include a series of strokes, which may be comprised of individual positions and measurements of free-hand input.

Ink objects may represent handwritten words, drawings, annotations, etc. An ink processing program module may discern between these various types of ink objects, examining both an object and its constituent strokes, possibly referencing nearby text and ink objects for context. Furthermore, a

program module may recognize handwritten words and symbols and provide an interpretation as text or other recognizable objects. For example, the handwritten word "hello" is displayed as a part of electronic ink **204**. A program module may be able to recognize each of the letters in context and provide an interpretation of "hello" as text, usable as additional input by ink-enabled application **120**.

The editing of documents frequently involves the use of selection tools, which assist a user in applying a common characteristic to a group of objects, be they text, images, ink objects, or other. Selection tools enable a user to select objects en masse, either by individually indicating the objects (e.g., clicking while holding down a Control key on a keyboard), selecting a box of objects (e.g., dragging a mouse to create a rectangle around a group of objects), or even selecting an irregularly shaped collection of nearby objects (e.g., dragging a mouse around the objects to create a selection boundary). Each of these selection methods is useful in different editing situations. Each has a different trigger for invoking the tool (e.g., the Control key, a selection command, a lasso icon, etc.). Ink enabled selection may involve the use of a lasso tool, by selecting a lasso icon, but it may also be triggered through use of a gesture, where the stylus is moved above the surface of display **201** in a particular fashion, possibly recognized using electro-magnetic sensors.

FIGS. **3** and **4** depict free-form selection boundaries (or paths) according to one or more embodiments of the invention. FIG. **3** depicts a possible selection path that may be used when "lasso" selecting a collection of objects. FIG. **4** depicts a possible selection path that may by used when using a wiper tool to select objects. Although these two selection methods may be triggered by separate commands, buttons, icons, or gestures, it may be possible to trigger free-form selection using a single command, and then examining the selection path to figure out what type of selection tool is intended. These selection paths may have been created using a pen or stylus on the surface of tablet display **201**, or possibly by using a mouse or other free hand input device.

Prior to generating selection path **301**, a user may have triggered a selection command by selecting a certain command, icon, button, menu item, etc. When generating selection path **301**, a user may have begun (e.g., put her stylus down) at start point **302** and completed the stroke at end point **303**. Likewise, for selection path **401**, the may have triggered a selection command, and then begun at start point **402**, ending the stroke at end point **403**. Once complete, an ink-processing module may begin the process of determining whether or not the selection path represents a "wipe" selection.

FIGS. **3** and **4** together depict one embodiment providing a method for determining whether or not a particular selection path constitutes a "wipe" selection. Other methods for discerning a wipe selection from other types of selections are certainly possible. For this method, a determination may be accomplished by analyzing the endpoints and the direction of motion (e.g. tangent rays) of selection paths **301** and **401**. For selection path **301**, the path moves from start point **302** in the direction of start arrow **304**, and from the end point **303**, the path moves in the direction of end arrow **305**. Clearly, it can be seen that these two arrows will not intersect, leading to the possible conclusion that a flatter "wipe" path was not intended, but instead, a more circular "lasso" path was intended. For selection path **401**, start arrow **404** and end arrow **405** do intersect at hypothetical point **406**. This intersection of arrows may lead to the conclusion that the user intended a flatter "wipe" path and wants to perform a wipe selection. As stated, other methods of determination may be used to discern a wipe selection.

FIGS. **5** and **6** together depict one embodiment providing a method for determining whether or not a particular wipe selection constitutes a vertical or horizontal wipe. Generally, a wipe selection involves the automatic selection of everything to the right or left of the selection above or below the selection. A user may indicate a wipe selection by drawing a flat or slightly curved selection path, as shown in both figures. Selection path **501** generally shows a horizontal line, apparently indicating a vertical wipe. A program module may automatically create a segment **502** between the start and end points of an apparent wipe, and then measure the angle **503** of the segment from the horizontal **504** (or some other reference segment). If the angle is within, for example, plus or minus ten degrees of horizontal, then the program module may automatically determine that a vertical wipe is intended before proceeding. Selection path **601** has a similar segment **602** generated. Measuring angle **603** puts the wipe as more vertical, perhaps within, for example, plus or minus ten degrees of vertical (90 degrees). Determining that the angle of the wipe selection is within a certain range allows a program module to determine the orientation of the wipe before proceeding. Again, it should be noted that the methods, measurements and tolerances provided are merely examples, and other values and methods for determining the orientation of a wipe are possible.

In addition to determining an orientation of either horizontal or vertical, analyzing the curvature of a wipe may further indicate a direction of a wipe. For example, vertical wipe **501** is curved, with the convex portion generally pointing down. In this situation, a downward wipe is apparently intended. Curving the wipe in the opposite direction may alternatively be determined to mean an upward wipe, although all vertical wipes may be determined to be downward wipes regardless of curvature. Likewise, horizontal wipe **601** curves in such a way as to indicate a wipe to the right. As an alternative to examining curvature, a user may indicate a direction of wipe, by tapping on one side or the other of the wipe line. Other methods for determining or receiving an input about the direction to be wiped may be possible. Once the orientation and direction of a wipe is determined, objects in the wipe zone can be selected.

FIG. **7** depicts a series of document objects being selected by vertical wipe **701** according to one or more embodiments. On the display is shown a series of objects including, electronic ink **702** and **703**, text **704** and **705**, and drawing **708**. A user, with a stylus, mouse, or other input device, has created a selection path across the middle of the display. Based on the slope of the line, a program module determines that the user most likely intended a vertical wipe. Further, due to the curvature of the wipe, a program module may determine that the wipe is directed downward. A wipe may then either select only those items directly below the selection path, or may broaden to extend across the document in both directions. Here, the scope of the wipe has been broadened, such that horizontal lines effectively extend from the endpoints out to the edge of the screen. Here, left extension **706** is higher than right extension **707**. Alternatively, the left and right extensions might extend out at the same level, such as the start point, the end point, or an average in the middle. Another alternative would be to have the lines extend not horizontally but at the same angle as an imaginary line drawn through the endpoint. Each extension includes an arrow to show the direction of the wipe, although this may be obvious based on what objects are selected.

Regardless of how the selection path and extensions are generated, the objects on the appropriate side of the line (here, below the line) are selected. Here, ink objects **702** and text **704** are all selected. If the selection path were to have intersected any of the objects, it may be up to the user or the program module to determine whether intersected objects would be selected. Once selected, the user may use his or her input device to grab and wipe the selected items. These objects can only be moved along a single dimension, here along a vertical path.

FIG. **8** depicts the same series of selected document objects after having been moved according to one or more embodiments. Here, ink objects **702** and text **704** have been wiped down the document. In moving down the document, the objects may have moved smoothly, or may have snapped at regular intervals. For example, the document here has rule lines **809** spaced at regular intervals. The objects may be restricted to wipe only in increments equivalent to rule lines **809**. Once wiped, empty space **820** is created.

FIG. **9** depicts the document objects with new inserted ink object **910** according to one or more embodiments. The empty space created by the wipe may now be used to insert new objects. Here, ink object **910** has been inserted.

FIGS. **10-12** depict text having a horizontal wipe in order to insert new text according to one or more embodiments. In FIG. **10**, the selection path created by the user crosses multiple lines of text **3**, **4**, and **5**. However, only one line should be selected for a horizontal wipe due to the flowing nature of text in the paragraph (e.g., one line flows into the next line). A program module may make an educated guess based on the number of lines crossed by the selection path. For example, if two lines were crossed, the line with most of the path in it may be selected. If several lines were crossed, then the midpoint of the selection path may be used to select a line. Once the line is determined, then the text to the left or right (depending on how that's determined) will be selected.

If the selection path had crossed through a word, then many courses of action could be taken. The word could be split in half depending on the characters intersected, or the whole word could be selected. Another alternative would be to select none of the word that is intersected. Were this a vertical wipe, all of the lines below or above the selection path may be selected. Depending on the type of line drawn, other methods for determining whether particular text or objects are selected could be used. These methods may include allowing a user to set a parameter (e.g., a checkbox or setting labeled "Select Intersected Words & Objects?").

In FIG. **11**, the user has wiped the text to the right. Again, because of the flowing nature of the paragraph, the words wrap around from line **4** to line **5**. Inserted into the gap on line **4** may be spaces, tabs, or even some type of placeholder, possibly awaiting whatever is to be inserted. FIG. **12** depicts the same paragraph, now with the addition of electronic ink handwriting on line **4**. Here, the new words have been written in the space created, ostensibly to be recognized and then replaced with equivalent text. At that point, any placeholder or additional spaces may be removed, depending on how the underlying ink-enabled application chooses to handle the insertion.

FIGS. **13-16** depict a collection of document objects, some of which are wiped to the right and to the left, according to one or more embodiments. FIG. **13** depicts an initial grouping of document objects having just been selected by horizontal wipe **1301**. Ink objects **1302**, **1303**, and **1304** along with drawing **1305**, and text **1306** have been determined to be in the "wipe zone," as delineated by arrows **1310** and **1311**. Here, ink objects that are intersected by selection path **1301** are selected, whereas intersected text (i.e. the word "is") is not selected. This may be the choice of the user or the creator of the ink-enabled software. The intersected drawing **1305** is also selected, even though not entirely in the zone.

FIG. **14** depicts the selected group of objects after having been wiped to the right. In particular, it should be noted that the formerly selected text **1306** has been separated from the text **1407** with which it was originally associated. This may result in spaces or other placeholders inserted into the grouping of text, or it may result in two separate collections or text objects.

FIG. **15** now shows the selection of ink object **1302** being selected by a left horizontal wipe **1501**. Here, no document objects are intersected, and merely the single object is set for a horizontal wipe to the left. FIG. **16** shows ink object **1302** after having been wiped back to the left. It should be noted that using the wipe, in the embodiments shown here, maintains the same vertical or horizontal value for the wiped objects, depending on the orientation of the wipe. This ensures a constant placement. However, other embodiments may allow free-form movement of the document objects selected by a free-form wipe tool.

FIG. **17** is a flowchart depicting a method for using a free-form wiper tool according to one or more embodiments. The method shown here is intended merely to represent one process by which a free-form wiper tool may be implemented. Steps in this flowchart may be combined, skipped, and additional steps may be added. At step **1701**, a selection command is received. This may be a general selection command, or one specifically designating a free-form wiper selection. This command may be received in the form of an interface or hardware button being pressed, a stylus gesture, voice command, or any other form of input. At step **1702**, some variety of free-form input is received via a stylus, mouse, or other input device, and at decision **1703**, the type of free-form selection is determined. If it is determined that a free-form wiper was intended (as opposed to a lasso selection or other type of selection), then the method continues on to decision **1704**. If it is not a free-form wiper, then the method ends, or control is passed to whichever process handles the appropriate type of selection.

At decision **1704**, it is determined whether the user intends a horizontal or vertical wipe. An angle of the selection path may be determined and the angle compared to ranges for each type of wiper, horizontal or vertical. A third option (not shown) would be to ignore the selection path if the wiper selection path is outside the ranges for a horizontal or vertical wipe. If the wiper is a vertical wipe, then objects below the wiper are selected at step **1705**. Other embodiments may include determining an upward or downward wipe and selecting the objects appropriately. If the wiper is determined to be a horizontal wipe, then at decision **1706**, it is determined whether the wipe is to the left or to the right. As stated above, this may be determined based on an additional user input, or on the curvature of the selection path. If a left wipe, then objects to the left of the wiper are selected at step **1707** and if a right wipe, then objects to the right are selected at step **1708**. For all three selection steps **1705**, **1707**, and **1708**, the selection path intersecting objects may complicate the process, but this can be handled programmatically, or through user preferences.

At step **1709**, the user determines the direction and distance of movement for the wipe selection. This may be limited to a single degree of motion, horizontally or vertically, and may further be limited by a grid or step value. The user may indicate direction and distance by either grabbing the selection and moving it using a mouse, stylus, etc., or by using

another form of input, such as arrow keys on a keyboard. At step **1710**, the objects are moved accordingly, while maintaining a consistent flow to any text flows encountered. After that, the method terminates normally.

Additional embodiments may add flexibility to the direction in which a selection path may select and move objects with a free-form wiper tool. FIG. **18**A depicts a series of document objects being dynamically selected by selection path **1801** according to one or more embodiments. Here, selection path **1801** begins with start point **1802**, but has not yet ended. The start ray **1807** associated with start point **1802** may or may not be visible to a user of a free-wiper tool. Start ray **1807** may be located based on a portion of selection path **1801** closest to start point **1802**. The ray may be tangent or close to tangent based on a certain length or percentage of the overall selection path. Start ray **1807** may be selected to fall along a horizontal or vertical axis associated with the start of selection path **1801**.

As a user continues entering selection path **1801** (e.g., by continuing to draw the path with a stylus or a mouse), a terminating ray **1808***a* is dynamically calculated, and appropriate objects may be selected and unselected dynamically. For example, when the selection path reaches point **1803***a*, terminating ray **1808***a* may be located (as shown) based on the most immediate portion of the path just drawn. For example, the direction of the most recent path pixels or recent percentage of the overall path (e.g., 5%) may be used. Terminating ray **1808***a* may be selected from among a vertical or horizontal axis associated with current point **1803***a* and extending in the direction of recent motion.

At this point in the creation of selection path **1801**, start ray **1807** is pointed to the right from start point **1802**, and terminating ray **1808***a* points up from the current location of the cursor. In addition to dynamically positioning terminating ray **1808***a*, objects falling between the start ray **1807** and dynamic terminating ray **1808***a* may be automatically selected and deselected based on their falling between the rays. Here, ink word **1804**, and drawing object **1805** fall within the quadrant delineated by the two rays and both are subsequently selected.

At a later point in time, selection path **1801** has moved in a different direction. FIG. **18**B depicts the same series of document objects being dynamically selected by selection path **1801** according to one or more embodiments. Here, selection path **1801** has been extended to point **1803***b*. As a result in the change of direction of motion, dynamic terminating ray **1808***b* has been repositioned along a horizontal rather than vertical axis. This repositioning of terminating ray **1808***b* may be visible to a user, with the ray "snapping" into place dynamically. When terminating ray **1808***b* moves, the selection of objects is updated, and now ink word **1806** is added to the selection, for a possible vertical wipe (e.g., which can be moved up or down rather than left or right). These three objects represent the visible objects located on a chosen side of the selection path. As discussed above, the particular side of the selection path may be based on an analysis of the path (e.g., curvature) or analysis of the changing selection (e.g., moving from the "up and right" quadrant to the "up" half of the document as opposed to the "down" half below the selection path).

FIG. **18**C depicts a third and final point for selection path **1801** over time according to one or more embodiments. Here, the direction of the selection path has changed once again before terminating at end point **1803***c*. Terminating ray **1808***c* is located pointing up along a vertical axis, and once again the initially selected group of objects is again selected, with ink word **1806** being deselected. The final selection is the "up and right" quadrant, and selected items may be constrained in how they may be moved. For a quadrant selection, rather than limiting the objects to one degree of motion, they may be moved in two directions, up or to the right. Additional embodiments may allow additional degrees of motion, for example, along a diagonal line, up and to the right.

FIG. **19** is a flowchart depicting a method for selecting objects in a document using two rays to select a selection region of the document. At step **1901**, and initial command is received indicating that a selection is about to be inputted. This command may come in the form of a button clicked on the screen, a keyboard shortcut, or even a gesture made by a stylus associated with display device. At step **1902**, the start of a free-form selection is received. Once enough information is collected, at step **1903** a direction and location for a start ray associated with the start of the selection path is determined. At step **1904**, the end of a selection path is received, and a terminating or "end" ray is determined at step **1905** as discussed above. The terminating ray may point in any direction, including the same direction as the start ray. At step **1906** a selection of objects is determined. This selection may be dynamically made during the movement of a cursor to create a selection path. Alternatively, the selection may be made once the selection path is terminated.

At step **1907**, a movement associated with the selection is received, and the selected objects may be moved at step **1908** in either a constrained or unconstrained fashion. As with the previous flowchart, the steps shown are intended as examples. Steps may be added, removed, combined, or otherwise modified and yet the process remain effectively the same.

Further embodiments may also provide alternatives to an end user for selecting objects on a document. In the case of a half, rather than quadrant selection, it may not always be clear which half of the document is intended to be selected. Although the curvature of the line may be analyzed, a close call may go the wrong way. A user may be able to shift the selection by inputting a particular command by clicking an icon, or by simply tapping or moving the cursor to the other half of the documents. For example, if a user draws a relatively straight line down the middle of a document, and the objects to the right of the line are automatically selected for a horizontal wipe, the user may shift the selection to objects on the left simply by moving the cursor and hovering over the other half. Default behavior may be programmed or otherwise be modified to weight the selection of objects based on a set of defaults. For example, when creating a horizontal wipe, objects below a line may always be selected initially. Likewise, objects to the right of a vertical wipe may be selected by default.

While methods and systems embodying the present invention are shown by way of example, it will be understood that the invention is not limited to these embodiments. The methods and systems described are merely examples of the invention, the limits of which are set forth in the claims which follow. Those skilled in the art may make modifications, particularly in light of the foregoing teachings. For example, those skilled in the art will see that the described free-form wiper tool need not be used an electronic ink-enabled application, but may be used in any conventional application using a mouse or other free-form input device.

We claim:

1. A computer-implemented method for enabling a free-form wiper in an electronic document, the method comprising:

receiving a free-form selection path;

determining whether the free-form selection path is at least one member of a group comprising: a free-form wiper and a free-form lasso, wherein determining whether the

free-form selection path is a free-form wiper includes analyzing rays tangent to endpoints of the free-form selection path to determine if the rays intersect;

determining a direction associated with the free-form selection path from among eight directions, up, down, left, right, up and left, up and right, down and left, and down and right; and

selecting document objects on the electronic document, objects that are situated in the direction relative to the free-form selection path.

2. The computer-implemented method of claim **1**, wherein the free-form selection path is received using a touch-sensitive display.

3. The computer-implemented method of claim **1**, wherein the document objects comprise electronic ink.

4. The computer-implemented method of claim **1**, wherein analyzing the free-form selection path comprises analyzing the curvature of the free-form selection path with respect to the end points of the free-form selection path.

5. A system for selecting and wiping document objects on an electronic document, the system comprising:

an input device for receiving a free-form selection input;

a display for displaying the electronic document;

a memory storing executable instructions; and

a processor configured to execute the executable instructions, including steps of:

receiving the free-form selection input from the input device;

determining whether the free-form selection input is at least one member of a group comprising: a free-form wiper and a free form lasso, wherein determining whether the free-form selection input is a free-form wiper includes analyzing rays tangent to endpoints of the free-form selection input to determine if the rays intersect;

determining an orientation associated with the free-form selection input;

determining a direction associated the free-form selection input; and

selecting document objects that are situated in the direction relative to the free-form selection input.

6. The system of claim **5**, wherein the processor is further configured to execute the steps of:

receiving a movement input; and

moving the selected document objects in accordance with the movement input.

7. The system of claim **6**, wherein the input device and the display are integrated, such that input directed to the display is sensed by the input device.

8. The system of claim **7**, wherein receiving the free-form selection input comprises receiving one or more strokes by a stylus upon the integrated input device display.

9. The system of claim **8**, wherein receiving a movement input comprises receiving one or more strokes by a stylus upon the integrated input device display.

10. The system of claim **6**, wherein moving the selected document objects in accordance with the movement input comprises moving the objects along a single degree of motion.

11. The system of claim **5**, wherein determining the direction associated with the free-form selection input comprises determining the direction from among at least four directions, up, down, left, and right.

12. The system of claim **5**, wherein the processor is further configured to execute the steps of:

receiving a selection command.

13. A computer-implemented method for enabling a free-form wiper in an electronic document, the method comprising:

receiving a free-form selection path;

determining a direction associated with the free-form selection path, wherein determining the direction includes analyzing the free-form selection path, wherein analyzing the free-form selection path to determine the direction includes determining a segment connecting the two ends of the free-form selection path, measuring an angle of variance between the segment and a reference segment, and comparing the angle of variance to a plurality of ranges, wherein each range is associated with a possible direction of the free-form selection path; and

selecting document objects on the electronic document, objects that are situated in the direction relative to the free-form selection path.

14. A computer-implemented method for enabling a free-form wiper in an electronic document, the method comprising:

receiving a free-form selection path;

determining a direction associated with the free-form selection path, wherein determining the direction includes analyzing the free-form selection path, wherein analyzing the free-form selection path to determine the direction includes:

determining a first ray associated with a start point of the free-form selection path from among at least one member of a group comprising: up direction, down direction, right direction and left direction,

determining a second ray associated with an end point of the free-form selection path from among at least one member of a group comprising: up direction, down direction, right direction and left direction, and

determining the direction as falling between the first and second rays; and

selecting document objects on the electronic document, objects that are situated in the direction relative to the free-form selection path.

15. A computer-readable storage medium having computer-executable instructions for enabling a free-form wiper in an electronic document, the instructions comprising:

receiving a free-form selection path;

determining whether the free-form selection path is at least one member of a group comprising: a free-form wiper and a free form lasso, wherein determining whether the free-form selection path is a free-form wiper includes analyzing rays tangent to endpoints of the free-form selection path to determine if the rays intersect;

determining a direction associated with the free-form selection path; and

selecting document objects on the electronic document, objects that are situated in the direction relative to the free-form selection path.

16. The computer-readable storage medium of claim **15**, wherein the free form selection path is received using a touch-sensitive display.

17. The computer-readable storage medium of claim **15**, wherein the document objects comprise electronic ink.

18. The computer-readable storage medium of claim **15**, wherein determining the direction includes analyzing the free-form selection path, wherein analyzing the free-form selection path to determine the direction includes determining a segment connecting the two ends of the free-form selection path, measuring an angle of variance between the segment and a reference segment, and comparing the angle of

variance to a plurality of ranges, wherein each range is associated with a possible direction of the free-form selection path.

19. The computer-readable storage medium of claim **15**, wherein determining the direction includes analyzing the free-form selection path, wherein analyzing the free-form selection path to determine the direction includes:

determining a first ray associated with a start point of the free-form selection path from among at least one member of a group comprising: up direction, down direction, right direction and left direction,

determining a second ray associated with an end point of the free-form selection path from among at least one member of a group comprising: up direction, down direction, right direction and left direction, and

determining the direction as falling between the first and second rays.

20. The computer-readable storage medium of claim **15**, wherein analyzing the free-form selection path comprises analyzing the curvature of the free-form selection path with respect to the end points of the free-form selection path.

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